

**Midterm Test #1 (Sunday 03-11-2013) Time: 1 <sup>1/2</sup> Hrs.**

**Q1-(25pts)**

a. Write the type of MIPS addressing mode for each instruction. **(10pts)**

(i) sw                      (ii) and                      (iii) beq                      (iv) jal                      (v) sltiu

b. Complete the gaps for each instruction and its machine code in the following table. **(15pts)**

|    | MIPS Instruction               | MACHINE CODE FORMAT              |
|----|--------------------------------|----------------------------------|
| 1. | lui \$t1, 0x_____              | 001111 _____ 1000110010000000    |
| 2. | addi \$t0, \$s0, -0x173E       | 001000 _____                     |
| 3. | or \$_, \$_, \$_               | 00000010001000001001000000100101 |
| 4. | J L1 #L1 at address 0x7CAF83B4 | 000010 _____                     |

**Q2-( 25pts)**

Suppose A,B and C are 32-bits signed integer local variables. The operation A+B will be executed in another procedure which is called "sum\_procedure", and the result value will be returned to the main procedure and stored into variable C. Explain the required steps to translate this operation to MIPS program.

**Q3-(25pts)**

Consider a vector A : A is an 8-bits unsigned integer vector with four elements. Write a MIPS assembly program to calculate the summation of the last three elements and store the result into A[0]. Assume vector A base address is corresponded to \$t0.

**Q4-( 25pts)**

Draw a 2 bit ALU circuit according to the following operation code written in the table below.

| Operation  | ALU operation code |                |                |                |                |
|------------|--------------------|----------------|----------------|----------------|----------------|
|            | S <sub>4</sub>     | S <sub>3</sub> | S <sub>2</sub> | S <sub>1</sub> | S <sub>0</sub> |
| A OR B     | x                  | x              | x              | 0              | 0              |
| A AND B    | x                  | x              | x              | 0              | 1              |
| A XOR B    | x                  | 1              | 0              | 1              | 0              |
| A XNOR B   | x                  | 1              | 1              | 1              | 0              |
| ADD(A+B)   | 0                  | 0              | 0              | 1              | 1              |
| SUB(A - B) | 1                  | 0              | 0              | 1              | 1              |

